

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:

Nathan R. Brown

Serial No.: 10/715,267

Filed: November 17, 2003

For: METHODS FOR POLISHING
SEMICONDUCTOR DEVICE
STRUCTURES BY DIFFERENTIALLY
APPLYING PRESSURE TO SUBSTRATES
THAT CARRY THE SEMICONDUCTOR
DEVICE STRUCTURES

Confirmation No.: 4590

Examiner: S. Macarthur

Group Art Unit: 1763

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REPLY BRIEF

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Attn: Board of Patent Appeals and Interferences

Sirs:

This Reply Brief is being filed in the format required by 37 C.F.R. § 41.41.

(VII) ARGUMENT

(A) CLAIM REJECTIONS UNDER 35 U.S.C. § 102

Claims 1 and 6-15 are rejected under 35 U.S.C. § 102(e) for reciting subject matter that is allegedly anticipated by the subject matter described in Kajiwara.

(3) ANALYSIS

It has been asserted that the “Appellant argues that the bladders 255 of Kajiwara et al do not apply pressure to the surface of a semiconductor device structure.” Examiner’s Answer, page 7. That is not what is argued. Rather, it has been explained that a plurality of different amounts of pressure are applied to different, selected locations. The description of Kajiwara is, in contrast, limited to forming a pressure gradient and applying the same across an entire surface of a semiconductor wafer. The bladders 255 of Kajiwara provide the pressure profile, or gradient, across the wafer surface.

Moreover, Kajiwara does not describe a method that includes using independently moveable pressurization structures. Specifically, the bladders 255 described by Kajiwara are not independently moveable, but rather are independently inflatable and pressurizable. When pressurized, the bladders 255 remain in place as air or gases are introduced therein.

Although Kajiwara describes bladders 254 disposed between a membrane 250 and subcarrier 212, the bladders 255 of the apparatus of Kajiwara do not individually apply pressure to a surface of a semiconductor device structure. They instead apply pressure to a membrane 250, which includes a surface 256 that contacts the entire back side 244 of the wafer 230, with the membrane 250 spreading at least some of the pressure across applied by the

bladders 255 to the back side 244 of the wafer 230. The Examiner's assertion that "the [present] claims do not exclude a membrane" (*id*) is irrelevant, as the presence of a membrane prevents the apparatus disclosed in Kajiwara from effecting the method recited in independent claim 1.

Further, based on the disclosure of Kajiwara, it is presumed that any pressure gradients are formed merely by the positioning of various bladders, as Kajiwara lacks any express or inherent description that one bladder may be pressurized differently from, or apply a different amount of pressure to a substrate than, any other bladder.

Therefore, Kajiwara does not expressly or inherently describe a method that includes biasing independently movable pressurization structures to selectively apply a plurality of different amounts of pressure to different, selected locations of a backside of the semiconductor device structure, as recited in independent claim 1.

Claims 6-15 are each allowable, among other reasons, for depending from claim 1, which is allowable.

Reversal of the 35 U.S.C. § 102(e) rejections of claims 1 and 6-15 is respectfully requested.

(B) CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 3-5 and 16-31 have been rejected under 35 U.S.C. § 103(a).

(3) ANALYSIS

(a) KAJIWARA IN VIEW OF CHEN

It is respectfully submitted that the teachings from Kajiwara and Chen, alone or in combination, do not support a *prima facie* case of obviousness against any of claims 16-31.

First, it is respectfully submitted that Kajiwara and Chen, alone or in combination, do not teach or suggest each and every element of independent claim 1, from which claims 3-5 depend. As noted above, Kajiwara does not teach or suggest biasing independently movable pressurization structures against the backside of a semiconductor device structure. The pressurization structure of the device taught in Chen includes magnets that are in fixed positions, as well as a flexible membrane that includes magnetic particles or particles that are attracted to a magnetic field. As the movable elements (*i.e.*, the particles) of that pressurization structure are carried by and spread out across a single flexible membrane 250 that interacts with the backside of a wafer, they are not independently movable. *See* Chen, col. 5, lines 65-67; col. 6, lines 32-67; col. 7, lines 1-15; FIG. 2; FIG. 4. Thus, neither Kajiwara nor Chen teaches or suggests biasing independently movable pressurization structures against the backside of a semiconductor device structure.

It has further been asserted that “the motivation to provide a magnetic force (in the form of magnetically sensitive particles) to bias the wafer magnetically is that this type of force is shown by Chen to provide enhanced control on the uniformity of the force applied to the substrate.” *Id.*, page 4. However, in view of the fact that neither Kajiwara nor Chen teaches or suggests an apparatus that includes elements that individually apply pressure to corresponding regions of a semiconductor substrate, one of ordinary skill in the art wouldn’t have been

motivated to combine the teachings of these references in the asserted manner, or had any reason to expect that their combination in the asserted manner would have been successful.

As a *prima facie* case of obviousness has not been established, it is respectfully submitted that, under 35 U.S.C. § 103(a), each of claims 3-5 is drawn to subject matter that is allowable over the teachings of Kajiwara and Chen.

(b) SOMMER OR CHEN IN VIEW OF WILLIAMS

It is respectfully submitted that there are several reasons that teachings from Sommer or Chen, in view of the teachings of Williams, do not support a *prima facie* case of obviousness against any of claims 16-31.

First, it is respectfully submitted that none of Sommer, Chen, or Williams, nor any combination thereof, teaches or suggests each and every claim element of the method of recited in independent claim 16. Specifically, the cited combination of references does not teach or suggest a method that includes “selectively applying [pressure] at locations beneath areas of . . . at least one second semiconductor device structure that correspond to . . . raised areas of [a] first semiconductor device structure,” as recited in claim 16. Rather, the teachings of Sommer are limited to polishing apparatus with a chamber 413 that may be pressurized with “air or other gas or fluid to vary [a] surface conformation of [a] platen 431.” Col. 15, lines 21-29; FIG. 17. The conformation of the platen 431 dictates the conformation of a wafer placed on the platen 431.

While Sommer teaches that a polishing support may include magnets, the magnets are merely included to move substrates in linear increments. Chen teaches methods for applying

pressure gradients to semiconductor wafers through membranes. Williams merely teaches methods for adjusting polishing times as polishing pads become less effective.

It has been acknowledged that neither Sommer nor Chen teaches or suggests polishing a second semiconductor device structure based on pressure applied to a first semiconductor device structure. Examiner's Answer, page 6. In addition, it has been asserted that "the measurements [of Williams] are used to ensure wafer uniformity of polishing subsequent wafers." *See* Examiner's Answer, pages 6 and 9. Although Williams teaches measuring the "before" and "after" thickness of the wafer, such measurements are only used to calculate adjustments in the polishing time to prolong the life of the polishing pad. Williams does not teach or suggest utilizing the before and after thicknesses to determine and selectively apply suitable polishing pressures for other wafers of the same type.

Second, it is respectfully submitted that, without the benefit of hindsight that the claims, one of ordinary skill in the art wouldn't have been motivated to combine teachings from Sommer or Chen with teachings from Williams in the asserted manner. In particular, the teachings of Sommer are directed to a polishing apparatus with magnets that facilitate incremental movement of a substrate carrier 402 relative to a polishing pad, whereas Chen teaches a method for applying a pressure gradient to a surface of a semiconductor device structure. As recognized by the Office, "[b]oth Sommer and Chen fail to [teach] polishing a second semiconductor structure based on the applied pressure of the first." *Id.*, pages 6 and 9. While Williams teaches monitoring wafer thicknesses to facilitate adjustments in polishing times as a polishing pad becomes worn or otherwise less effective, Williams does not teach or suggest evaluating raised areas of a first semiconductor device following polishing thereof, then using that information to

improve the planarity of subsequently polished semiconductor devices of the same type. Because none of the cited references, nor any combination thereof, teaches or suggests a method that includes the elements of claim 16, it is respectfully submit that the Examiner's conclusion of obviousness is based on improper hindsight reconstruction.

It is submitted that “[t]he motivation to modify the teachings of Sommer or Chen is to enhance the capabilities of the apparatus from the application of pressure to a specific wafer to wafers in an entire lot or branch.” *Id.*, page 6. However, no guidance, or convincing line of reasoning, as to how one of ordinary skill in the art would have been motivated to combine the referenced teachings to enhance the capabilities of the apparatus has been provided. In the absence of any objective reason that would have prompted one of ordinary skill in the art to combine the elements of Sommer, Chen and Williams, it is respectfully submitted that the obviousness rejections of claims 16-31 under 35 U.S.C. § 103(a) are improper.

Third, it is respectfully submitted that, since none of Sommer, Chen, or Williams teaches or suggests evaluating raised areas of a first semiconductor device following polishing thereof, then using that information to improve the planarity of subsequently polished semiconductor devices of the same type, one of ordinary skill in the art wouldn't have had any reason to expect that the teachings of Sommer or Chen could have been successfully combined with teachings from Williams in the asserted manner.

Therefore, no combination of teachings from Sommer, Chen, or Williams supports a *prima facie* case of obviousness against independent claim 16 under 35 U.S.C. § 103(a). As such, under 35 U.S.C. § 103(a), the subject matter recited in independent claim 16 is allowable over the subject matter taught in Chen, Sommer, and Williams.

Each of claims 17-31 is allowable, among other reasons, including those previously set forth in the Appeal Brief, for depending directly or indirectly from claim 16, which is allowable. Reversal of the 35 U.S.C. § 103(a) rejections of claims 16-31 is respectfully requested.

(XI) CONCLUSION

It is respectfully submitted that:

- (A) Claims 1 and 6-15 are allowable under 35 U.S.C. § 102(e) for reciting subject matter that is novel over the subject matter described in Kajiwara;
- (B) Claims 3-5 are allowable under 35 U.S.C. § 103(a) being drawn to subject matter that is patentable over the subject matter taught in Kajiwara, in view of teachings from Chen; and
- (C) Claims 16-31 are allowable under 35 U.S.C. § 103(a) for being directed to subject matter which is patentable over the teachings of Sommer or Chen, in view of teachings from Williams.

Accordingly, it is respectfully requested that the rejections of claims 1-31 be reversed,
and that each of these claims be allowed.

Respectfully submitted,



Tracey Harrach
Registration No. 57,764
Attorney for Applicants
TRASKBRITT
P.O. Box 2550
Salt Lake City, Utah 84110-2550
Telephone: 801-532-1922

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